STATE OF IDAHO DEPARTMENT OF FISH AND GAME

THE STEELHEAD SPORT FISHERY OF THE SOUTH FORK SALMON RIVER DRAINAGE 1960 -, 1961

By
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Introduction

The steelhead fishery in Idaho has increased greatly in popularity during recent years. Because of the large area and varied means of access involved in this fishery, detailed and precise harvest data have been limited.

The South Fork Salmon River drainage steelhead fishery is confined to a relatively small area with limited access. Complete harvest data were gathered in 1961 and partially complete data were obtained in 1960. Partial data on the Makay Bar fishery from the main Salmon River at the mouth of the South Fork Salmon River are included. The Makay Bar area has a large concentration of wintering steelhead and it is assumed that the harvest from this area would influence steelhead runs into the South Fork Salmon River.

The purposes of this report are to present a realistic picture of the South Fork Salmon River drainage steelhead fishery and to present detailed data which can be used in intensive management of the fishery.

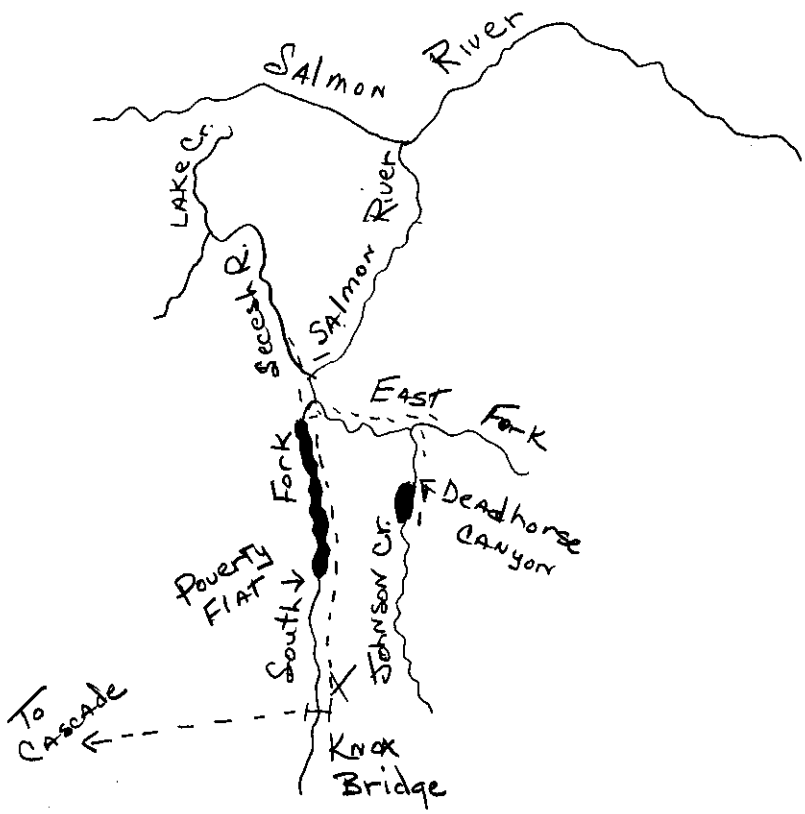
Description of the Fisheries

South Fork Salmon River Drainage

The steelhead fishery of the South Fork Salmon River drainage is readily accessible to the large population centers of the Boise and Payette River Valleys. The relative size of the fishery, as compared to other local steelhead fisheries in Idaho, is unknown at this time. The drainage is composed of three river systems: the South Fork proper, East Fork of the South Fork, and Secesh River (Figure 1).

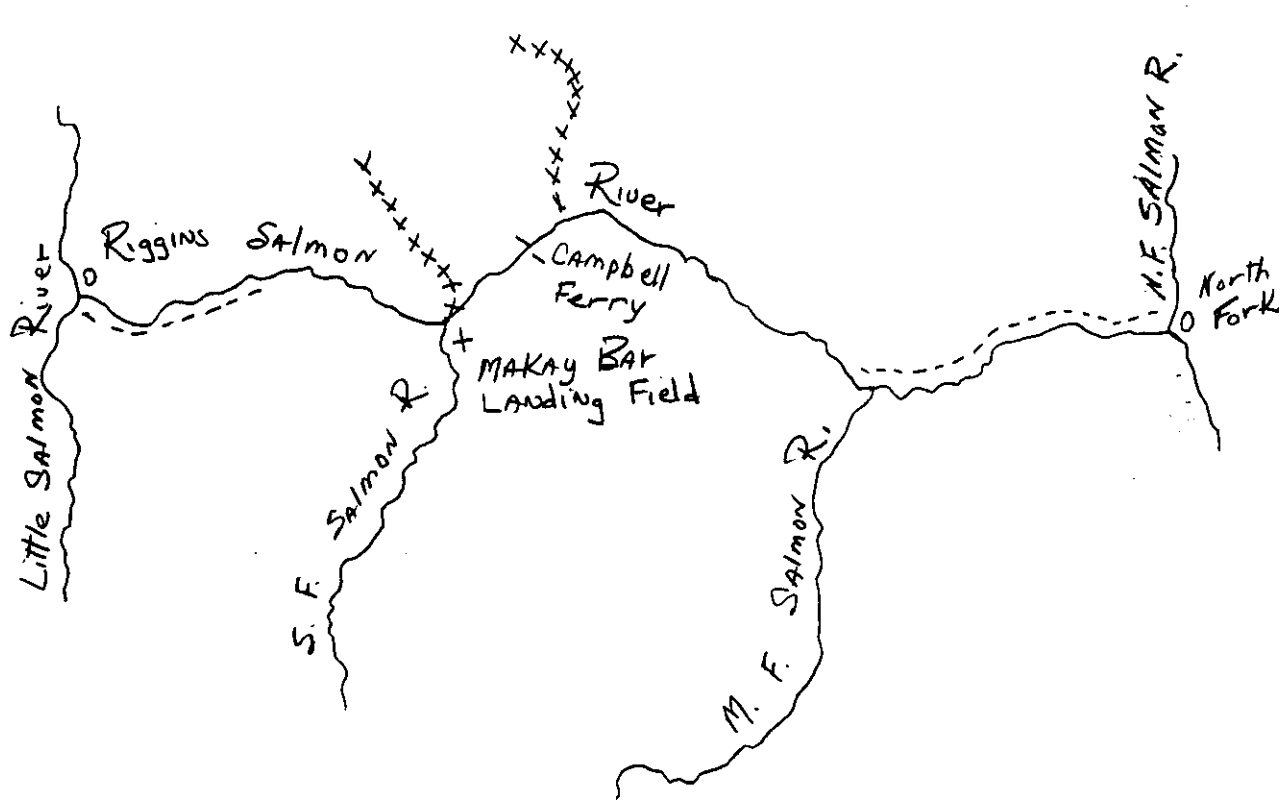
The South Fork below Knox Bridge, the Secesh River, East Fork and Johnson Creek (a tributary to the East Fork) are open to steelhead fishing by regulation from January 1 to October 31. The general fishing season of June 4 to October 31 applies to all tributaries of the above streams. The steelhead runs into the South Fork drainage are composed exclusively of summer run fish. These fish do not enter the upper South Fork drainage during the fall months, and the general fishing season of June 4 to October 31 is, in effect, a closed season on steelhead. Bag and possession limits during 1960 and 1961 were two fish. Steelhead under 20 inches in length are classed as trout, and the trout bag and possession limits apply. Maximum multiple hook size permitted in 1960

Figure 1. Outline of South Fork Salmon River drainage steelhead fishing area, 1961 (one inch equals approximately 20 miles)



Open roads -------
Checking station X
Major steelhead spawning areas ▬

Figure 2. Outline of Makay Bar steelhead fishing area
(one inch equals approximately 20 miles)



---------- Open roads during fishing period

xxxxxxxxxxxx Roads open only in early fall during fishing period

was five-sixteenths inch from point of hook to shank. Use of all multiple hooks was prohibited in 1961. Maximum single hook size permitted is one-half inch from point of hook to shank.

While large portions of the drainage are open to steelhead fishing by regulation, lack of vehicle access during the fishing period confines the actual fishery to the South Fork from a few miles below the Secesh River upstream to Knox Bridge, the East Fork up-stream to Johnson Creek, the lower eight miles of Johnson Creek, and the lower four miles of the Secesh River (Figure 1). Access to the drainage during the steelhead season is limited, by snow conditions, to entry roads from the towns of Cascade and McCall. During recent years, one or both of these roads have been open, often intermittently, during most of the fishing period. Travel conditions on these roads influence fishing pressure from year to year and during the fishing period in any one year.

Steelhead normally appear in the fishing area in late March or early April. Observations and sampling have indicated that, in a typical year, harvest reaches a peak during the latter half of April and high water terminates the fishery in mid-May. As in most spring steelhead fisheries, water conditions have a considerable effect on fishing success.

Major steelhead spawning areas in the fishing area are present in the South Fork from the East Fork upstream to Poverty Flat and in Johnson Creek above Deadhorse Canyon (Figure 1). There is a comparatively limited amount of spawning in the South Fork above Poverty Flat and in the East Fork.

Makay Bar

The Makay Bar steelhead fishery takes place in the main Salmon River in the vicinity of the mouth of the South Fork Salmon River.

Makay Bar itself lies at the mouth of the South Fork. During recent years, however, the Makay Bar fishing area has been commonly defined as extending from the end of the road above Riggins to Campbell Ferry above the South Fork of the Salmon River (Figure 2). This stream section is a major wintering area 'for Salmon River steelhead, and the fishery is highly productive in terms of fishing success. The Salmon River is open by regulation to year around fishing through this stream section.

"Vehicle access to the fishery is possible only in early fall, and access is primarily by airplane and boat. Boats enter the area from both downstream and upstream vehicle access points (Figure 2). The advent of the jet boat has considerably increased access to the Makay Bar area.

Steelhead appear in the vicinity of Makay Bar during late September. The fishery is normally curtailed during December and January due to ice conditions and reduced catchability of fish. Depending on weather and water conditions, the fishery resumes in February and continues until most of the fish have left the area, which is normally in mid-April.

At the present time the harvest of fish in the fall is largely incidental to big game hunting in the area. Water conditions are normally stable during the fall months, and the harvest during this period is probably governed principally by the number of fish present and the fishing pressure. The harvest of fish in spring is governed to a great extent by water conditions and to some extent by flying conditions, which often limit access.

The lower South Fork Salmon River is open to fishing by regulation during the spring months but lack of access limits the fishery to the immediate area at the mouth of the river. Tagging studies have shown that there is considerable milling of steelhead in wintering areas. Steelhead caught in the extreme lower portion of the South Fork would not necessarily be part of the South Fork runs. It is assumed, however, that a significant number of the steelhead wintering in the Makay Bar area are from South Fork Salmon River stocks of fish.

Harvest

South Fork Salmon River - 1960

Prior to 1960 no detailed harvest data had been gathered on the South Fork Salmon River drainage fishery. During the 1960 fishing period a system of streamside counts and temporary checking stations was devised to utilize available manpower and obtain an estimate of the harvest.

The first fish was caught on April 3 and high water terminated the fishery for all practical purposes on May 17. A complete count of fishermen and harvest was attempted

on all but the first and last weekends of the fishing period. Counts were made on two weekdays each during the last week in April and the first week in May. Temporary checking stations, placed so that all fishermen had completed fishing and were leaving the area when checked, were operated on weekends during the peak harvest period. Streamside counts were used during the remainder of the period. Fishermen, when interviewed, were asked how many days they had fished and the stream section in which fish were caught. Data were stratified by weekend and weekdays and projected accordingly.

Harvest data for 1960 are not precise. Observations in 1961 when complete counts were available for comparison indicate that streamside counts were minimum. Temporary checking stations are not completely effective and those counts must also be considered minimum. Fishing pressure and harvest during the weeks that were sampled were higher than during the first and last weeks of the fishing period which were not sampled. Projection of the data inflates the harvest estimate. The bias introduced by the minimum checking station and streamside counts is considered the more important, and the harvest estimate is considered a minimum estimate. The. 1960 harvest data for the South Fork drainage are shown in Table 1.

Both access road's were opened during part of the fishing period but travel conditions into the fishing area were relatively poor through most of the fishing period in 1960. Water conditions also were considered poor. These factors limited fishing pressure and success.

The South Fork proper contributed 81 percent of the estimated catch of steelhead from the drainage. The East Fork, Johnson Creek and Secesh River accounted for 10, 8 and 1 percent, respectively, of the total harvest.

As previously stated, the 1960 harvest data are not precise. However, allowing for differences in travel and water conditions these data do agree reasonably well with the 1961 data which are of known accuracy. The actual harvest for 1960 probably was some-where between 250 and 350 steelhead.

South Fork Salmon River - 1961

During the 1961 fishing period only one access road was open into the fishing area. **A** permanent checking station was maintained on this road throughout the fishing period

Table 1. Summary of harvest data, South Fork Salmon River drainage steelhead fishery, 1960.

Number of fishermen	Number of fishermen days	Number of fish harvested	Fish per trip	Fish per day	Days per trip
860	1,163	250	0.29	0.21	1.3

and complete harvest data were obtained. The first fish was caught on March 26. The checking station went into operation on April 1 and was discontinued on May 22 because of high water and the resultant lack of fishermen.

The checking station was placed so that all fishermen had completed fishing and were leaving the area when checked. Data obtained at the checking station included: number of fishermen in the party, number of fish caught, stream section where fish were caught, total days spent fishing, and county or state registration of vehicles.

Data were kept separately for the South Fork above the East Fork (hereinafter referred to as the upper South Fork), the South Fork below the East Fork (hereinafter referred to as the lower South Fork), the East Fork, Johnson Creek and the Secesh River. Data from which tables and figures in the text were derived are shown in tabular form in the appendix. All harvest data are presented by day of passage through the checking station. No attempt was made to obtain actual dates involved. Because of checking station placement, the number of fishermen recorded and the number of trips are the same.

So far as is known a complete check of fishermen leaving the area was obtained. For all practical purposes the enumerated harvest is considered to be the actual harvest from the fishing area.

Travel conditions into the fishing area were relatively good during most of the fishing period in 1961. Based on past observation's, water conditions were considered average. While no comparable data are available, observations of the fishery during recent years indicate that fishing pressure in 1961 was probably the greatest that has been experienced on the South Fork drainage.

A total of 1,819 fishermen or trips was recorded through the checking station. These anglers fished 3,052 fisherman days to harvest 561 steelhead. An additional 23 fish were

steelhead. Fishing success and days per trip, by stream or stream section, are shown in Table 2. Comparative importance of streams or stream sections to the fishery is shown in Table 3. The most important fishing area was the upper South Fork; the highest rate of fishing success was achieved on Johnson Creek.

Table 2. Fishing success and days per trip, by stream or stream section, South Fork Salmon River drainage, 1961.

Stream	Fish per trip	Fish per day	Days per trip
Upper South Fork	0.29	0.19	1.6
Lower South Fork	0.33	0.18	1.8
Johnson Creek	0.43	0.25	1.7
East Fork	0.21	0.11	1.8
Secesh River	0.00	0.00	0.0
South Fork drainage average	0.31	0.18	1.7

Table 3. Comparative importance of streams or stream sections to the South Fork Salmon River drainage steelhead fishery, 1961.

Stream	Trips		Days		Harvest	
	Number	Percent of total	Number	Percent of total	Number of fish	Percent of total
Upper South Fork	1,063	58	1,686	55	314	56
Lower South Fork	540	30	981	32	176	31
Johnson Creek	116	6	202	7	50	9
East Fork	100	5	183	6	21	4
Secesh River	0	0	0	0	0	0
Total	1,819	99	3,052	100	561*	100

* An additional 37 fish were caught before the checking station was in operation and by residents within the fishing area. Total harvest was 598 steelhead.

There was no marked change in fishing success from beginning to end of the fishing period although a slight increase was apparent during the last half of the period (Figure 3). An inverse relationship is apparent between daily fishing pressure and fishing success (Figure 3 and b). It is recognized that harvest data are not strictly comparable on a daily basis, as. data were recorded by date of passage through the checking station rather than by actual dates involved. From the existing data, however. it appears that the inverse relationship would be even more pronounced if data were

available by actual dates involved. It appears also that fishing pressure exerted a greater influence on daily fishing success than did water conditions.

There are two apparent factors which influence this inverse relationship between fishing pressure and success. The upper South Fork fishery takes place to a large degree on shallow spawning areas. Harassment of fish in these areas by large numbers of fisher-men soon frightens the fish and sends them into hiding, reducing their catchability. This situation does not occur on days when fishing pressure is low or in deeper waters below the spawning area, such as the lower South Fork. The inverse relationship is not as pronounced in the lower South Fork as in the upper South Fork (Figures 6 and 7).

The other factor involves fishing prowess of individual fishermen or groups of fishermen. On days when fishing pressure is highest, such as weekends, a larger pro-portion of unskilled fishermen apparently are present. Conversely, on days when fishing pressure is lowest, such as weekdays and days when water conditions are poor, a larger proportion of skilled fishermen are present. Checking station records show that Valley County fishermen from Cascade and McCall, who are familiar with the fishery, tend to make up a greater proportion of the fishing pressure on days when pressure is low. Based on vehicle registration, Valley County fishermen had an average fishing success of 0.27 fish per day as compared to 0.16 fish per day for the remainder of the fishermen.

Harvest in general followed the same pattern as fishing pressure (Figures 2 and 5). Because of the factors influencing fishing success, however, harvest was not proportional to fishing pressure. The greater share of the harvest was taken during the month of April. Harvest, by week, for the drainage as a whole and by stream or stream section is shown in Tables 4 and 5.

The pattern of fishing pressure and harvest was considerably different in the upper and lower South Fork (Figures 6 through 9). In the lower South Fork practically the entire harvest was taken during the first half of the fishing period, a condition to be expected as fish move from the lower waters to upstream spawning areas. Approximately 90 percent of the harvest from the upper South Fork was taken below Poverty Flat. The higher rate of fishing success (0.38 fish per day), however, was achieved above Poverty Flat.

Table 4. Harvest and fishing pressure, by week, South Fork Salmon River drainage steelhead fishery, 1961.

Period	Harvest		Fishing pressure	
	Number of fish	Percent of total	Number of fishermen	Percent of total
4/1 to 4/8	61	11	209	11
4/8 to 4/15	122	22	356	20
4/15 to 4/22	122	22	424	23
4/22 to 4/29	111	20	277	15
4/29 to 5/6	73	13	327	18
5/6 to 5/13	48	8	123	7
5/13 to 5/22	24	4	103	6
Total	561*	100	1,819	100

* Includes only fish recorded as to date through checking station.

Fishermen vehicles from seven different states and 14 of the 44 Idaho counties were checked through the station. Average number of fishermen per car was 2.4. Non-resident anglers, based on vehicle registration, comprised 3.1 percent of the fishermen checked and caught 2.8 percent of the total harvest. Ada, Valley and Canyon County vehicles, in order of importance, made up 75 percent of the resident vehicles checked. Number and percent of vehicles checked, by state and by county, are shown in Table 6. Makay Bar

In the spring of 1960 the operator of the Makay Bar facilities was asked to obtain harvest data from boat parties brought in by him and from steelhead fishermen using the landing field. Forms were supplied and data gathered included: number of fishermen in the party, number of days fished, and number of fish caught. Excellent cooperation was received and the program was continued through 1961. As a landing fee is charged at the field, practically all fishermen using the field were interviewed. Data were obtained when fishermen were finished fishing and leaving the area. The number of steelhead caught applies only to fish caught and kept. On certain days more fish were caught and released than were kept. Data from which tables and figures in the text were derived are shown in tabular form in the appendix.

The harvest data gathered concern only one segment of the Makay Bar fishery. These data may not be complete but are considered sufficiently reliable to reflect the trend of

Table 5. Harvest and fishing pressure, by week and by stream or stream section, South Fork Salmon River drainage steelhead fishery, 1961.

Stream		Harvest*		Fishing pressure	
		Number of fish	Percent of total	Number of fishermen	Percent of total
Upper South Fork	4/1 to 4/8	10	3	64	6
	4/8 to 4/15	38	12	109	10
	4/15 to 4/22	70	22	235	22
	4/22 to 4/29	76	24	198	19
	4/29 to 5/6	62	20	263	25
	5/6 to 5/13	45	14	116	11
	5/13 to 5/22	13	4	78	7
	Total	314	99	1,063	100
Lower South Fork	4/1 to 4/8	48	27	138	26
	4/8 to 4/15	77	44	225	42
	4/15 to 4/22	32	18	132	24
	4/22 to 4/29	17	10	32	6
	4/29 to 5/6	2	1	13	2
	5/6 to 5/13	0	0	0	0
	5/13 to 5/22	0	0	0	0
	Total	176	100	540	100
Johnson Creek	4/1 to 4/8	0	0	0	0
	4/8 to 4/15	1	2	1	1
	4/15 to 4/22	14	28	31	27
	4/22 to 4/29	16	32	23	20
	4/29 to 5/6	7	14	35	30
	5/6 to 5/13	3	6	5	4
	5/13 to 5/22	9	18	21	18
	Total	50	100	116	100
East Fork	4/1 to 4/8	3	14	7	7
	4/8 to 4/15	6	29	21	21
	4/15 to 4/22	6	29	26	26
	4/22 to 4/29	2	9	24	24
	4/29 to 5/6	2	9	16	16
	5/6 to 5/13	0	0	2	2
	5/13 to 5/22	2	9	4	4
	Total	21	99	100	100

* Includes only fish recorded as to date through checking station.

Table 6. Number and percent of fisherman vehicles checked, by state and by county, South Fork Salmon River drainage steelhead fishery, 1961.

State	Non-resident Number	Non-resident Percent	County	Resident Number	Resident Percent
Utah	10	50	Ada	281	42
Washington	4	20	Valley	173	26
California	2	10	Canyon	80	12
Oregon	2	10	Gem	33	5
Nevada	1	5	Elmore	30	5
Kansas	1	5	Boise	26	4
			Adams	14	2
Total	20	100	Payette	10	2
			Owyhee	7	1
			Others	9	1
			Total	663*	100

* Vehicle registration not obtained for 52 vehicles.

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fishing pressure and harvest throughout the season in the Makay Bar area. Fishing success and days per trip, by fishing period, are shown in Table 7. Comparative importance of fishing periods is shown in Table 8.

Table 7. Fishing success and days per trip.

Fishing period	Fish per trip	Fish per day	Days per trip
Spring - 1960	0.51	0.40	1.3
Fall - 1960	1.12	1.06	1.1
Spring - 1961	0.96	0.94	1.0

Table 8. Comparative importance of fishing periods, Makay Bar steelhead fishery, 1960 - 1961.

Fishing period	Number of trips	Number of fisherman days	Number of fish harvested
Spring - 1960	70	91	36
Fall - 1960	146	154	164
Spring - 1961	415	423	398

The 1960 spring fishing period was curtailed considerably because of poor water conditions. Fishing success also was adversely affected. Harvest and fishing pressure, by week, are shown in Table 9.

Harvest data were gathered for both the fall and spring fishery during the 1960-61

Table 9. Harvest and fishing pressure, by week, Makay Bar steelhead fishery, spring fishing period, 1960.

Period	Harvest		Fishing pressure	
	Number of fish	Percent of total	Number of fishermen	Percent of total
3/14 to 3/21	21	58	44	63
3/21 to 3/28	0	0	0	0
3/28 to 4/4	4	11	9	13
4/4 to 4/11	9	25	6	9
4/11 to 4/18	0	0	1	1
4/18 to 4/25	2	6	5	7
4/25 to 5/2	0	0	5	7
Total	36	100	70	100

steelhead run. Water conditions were relatively good during the spring fishing period, and this period was the most important in terms of harvest and fishing pressure. Fishing success was higher during the fall period. Harvest and fishing pressure for the 1960-61 steelhead run are shown, by week and by fishing period, in Figures 10 and' 11 and Table 10.

As previously stated the harvest data presented above concern only one segment of the Makay Bar steelhead fishery. An estimate of the total harvest from the 1960-61 steelhead run in the Makay Bar area can be arrived at by projecting the harvest from this segment to the estimated **size** of the remainder of the fishery. Such an estimate is based primarily on observations and informal reports of harvest from other segments of the fishery and should be accepted with reservations. The estimated total harvest from the 1960-61 steelhead run was 1, 000 fish.

Discussion

It is apparent from the harvest data gathered to date that there would be a number of factors to be considered in an intensive management program for the South Fork Salmon River drainage steelhead fishery.

Weather and water conditions influence harvest during the fishing period, These factors are beyond control and would have to be largely ignored in any future regulation. There is a considerable difference in the pattern of harvest from the individual streams or stream sections within the drainage. There is no measure of escapement from the fishery and comparative size of annual runs cannot be determined. It appears that harvest in the South Fork drainage fishery would not necessarily increase in direct proportion

Table 10. Harvest and fishing pressure, by fishing period and by week, Makay Bar steelhead fishery, 1960-1961.

Period	Harvest		Fishing pressure	
	Number of fish	Percent of total	Number of fishermen	Percent of total
Fall - 1960				
9/29 to 10/6	6	4	6	4
10/6 to 10/13	3	2	3	2
10/13 to 10/21	73	45	66	45
10/21 to 10/28	4	2	6	4
10/28 to 11/4	13	8	8	5
11/4 to 11/11	30	18	22	15
11/11 to 11/18	13	8	11	8
11/18 to 11/25	13	8	12	8
11/25 to 12/2	9	5	12	8
Sub-total	164	100	146	99
Spring - 1961				
2/18 to 2/25	25	6	25	6
2/25 to 3/4	93	23	79	19
3/4 to 3/11	104	26	96	23
3/11 to 3/18	55	14	70	17
3/18 to 3/25	71	18	92	22
3/25 to 4/12	50	13	53	13
Sub-total	398	100	415	100
Total	562		561	

to increasing fishing pressure.

It is assumed that the Makay Bar fishery has a significant effect on runs of steelhead into the South Fork drainage. The magnitude of this effect, however, has not been measured. The limited data on hand suggest that harvest in the Makay Bar area would tend to increase in proportion to increased fishing pressure. Any regulation of the South Fork drainage fishery that would shift fishing pressure to the wintering area at Makay Bar could possibly result in an increase rather than a decrease in harvest.

The greatest difficulty in an intensive management program for the South Fork drainage would be in determining if restriction of the fishery is necessary and if so, to what extent. At the present time, the only realistic method of judging the condition of steelhead stocks in the drainage would appear to be by use of detailed and comparable harvest data over a period of years.

It is felt that existing data, with additional comparable data gathered in succeeding years, would be adequate to make realistic reductions in harvest once the need and extent of such reductions are established.

Future Management

The time can be foreseen when increasing steelhead fishing pressure will necessitate the taking of the absolute maximum possible harvest from the South Fork drainage that can be taken without diminishing the runs.

To achieve this degree of intensive management safely, continuation of the present checking station program and the use of additional, presently unavailable, data would be necessary. The magnitude of the effect of the Makay Bar fishery on the South Fork drainage steelhead runs should be measured. This could possibly be achieved by tagging studies originating at Makay Bar. Some measure of escapement from the fishery would be imperative. A counting weir in the upper South Fork would be feasible. A count of fish into this stream section and the known harvest supplied by checking station data would give a known escapement for this fishery. Precise information on this escapement, in conjunction with other harvest data, would be adequate to evaluate escapement from the South Fork drainage fishery.

Figure 3. Fishing success, expressed as fish caught per day, as reported by day through South Fork Salmon River steelhead checking stations, 1961.

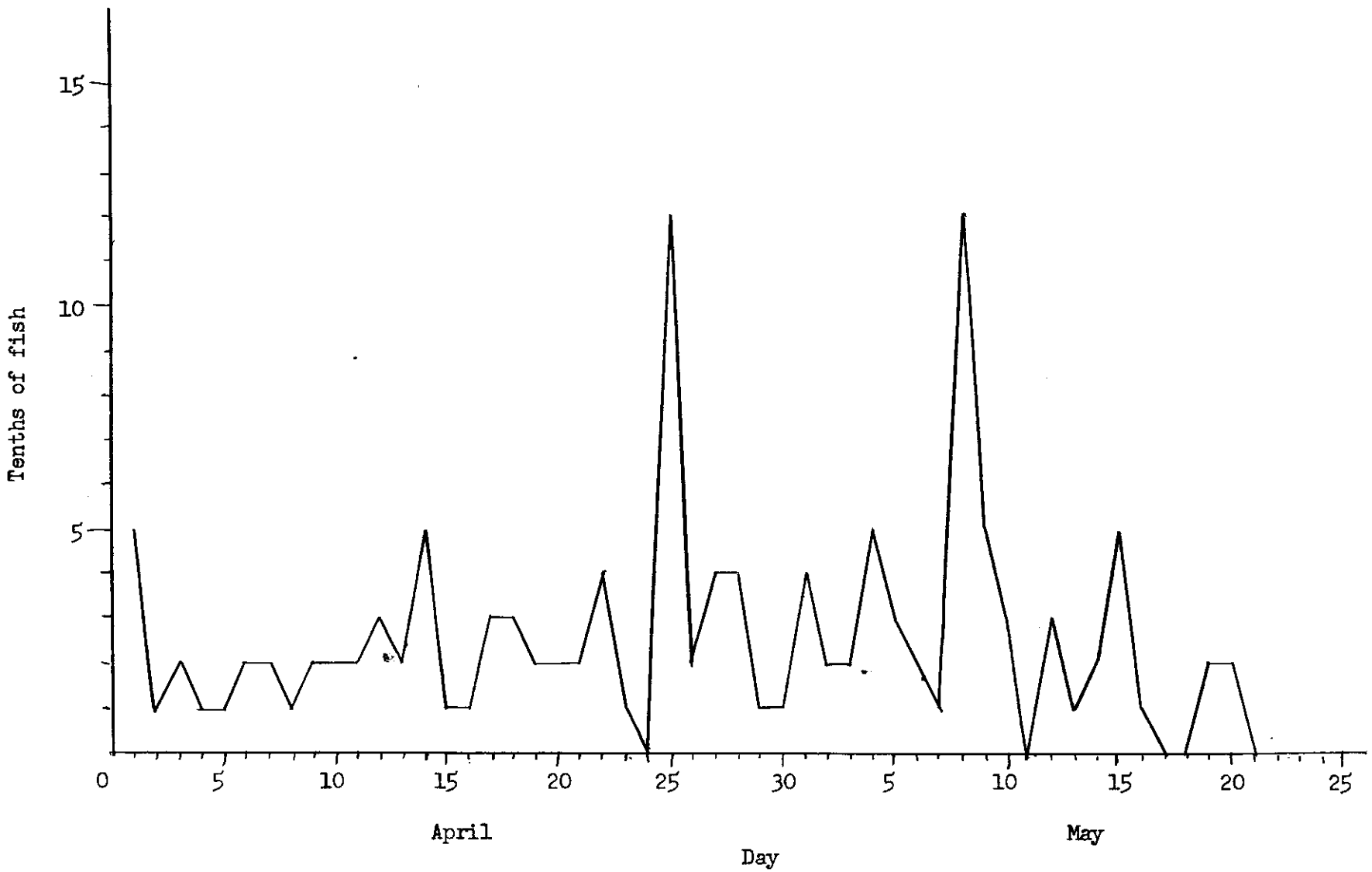


Figure 4. Number of fishermen, by day, checked through South Fork Salmon River drainage steelhead checking stations, 1961.

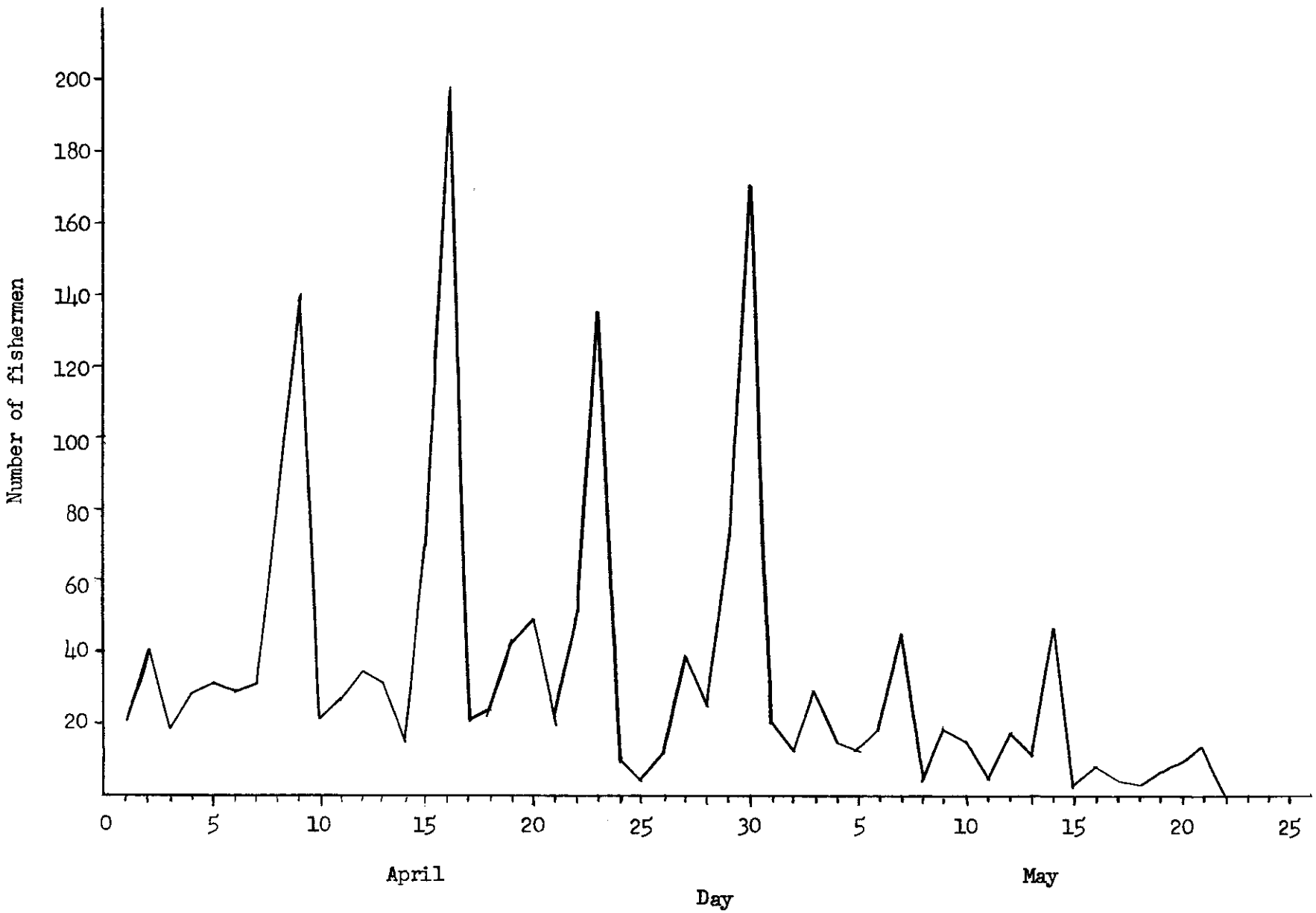


Figure 5. Number of steelhead, by day, checked through South Fork Salmon River drainage checking stations, 1961.

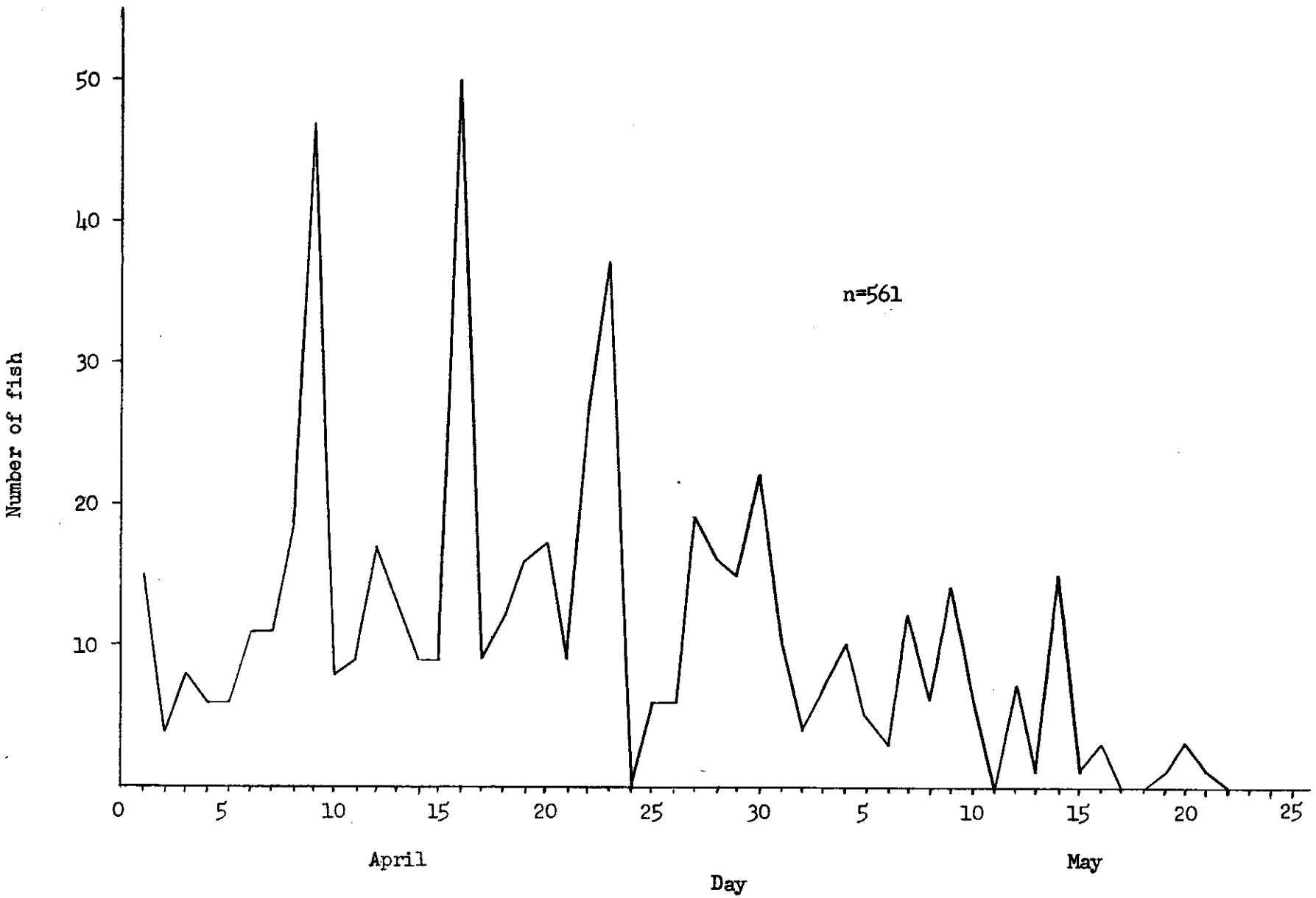


Figure 6. Fishing pressure and success, by day, as reported through South Fork Salmon River drainage steelhead checking stations, upper South Fork, 1961.

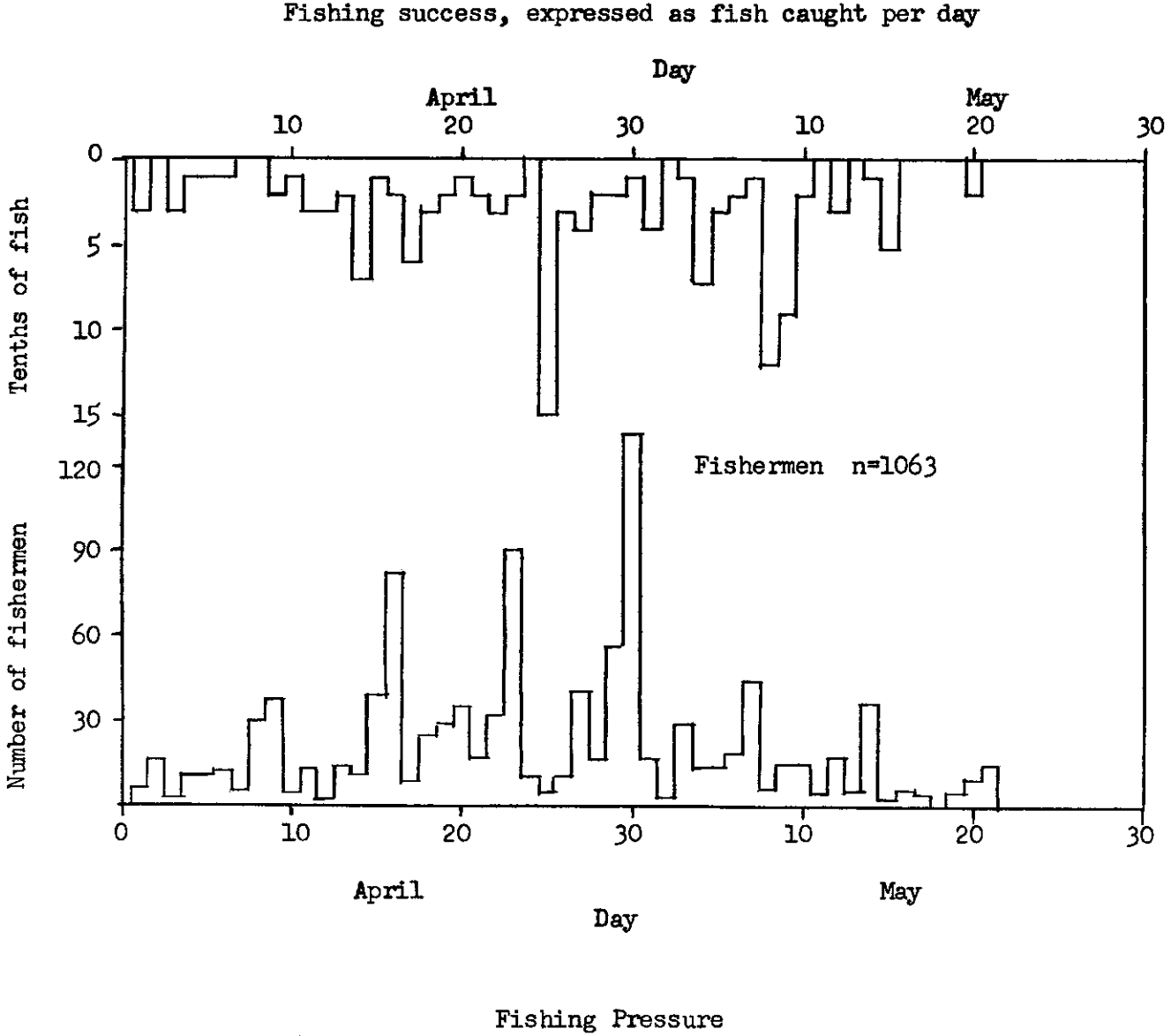


Figure 7. Fishing pressure and success, by day, as reported through South Fork Salmon River drainage steelhead checking station, lower South Fork, 1961.

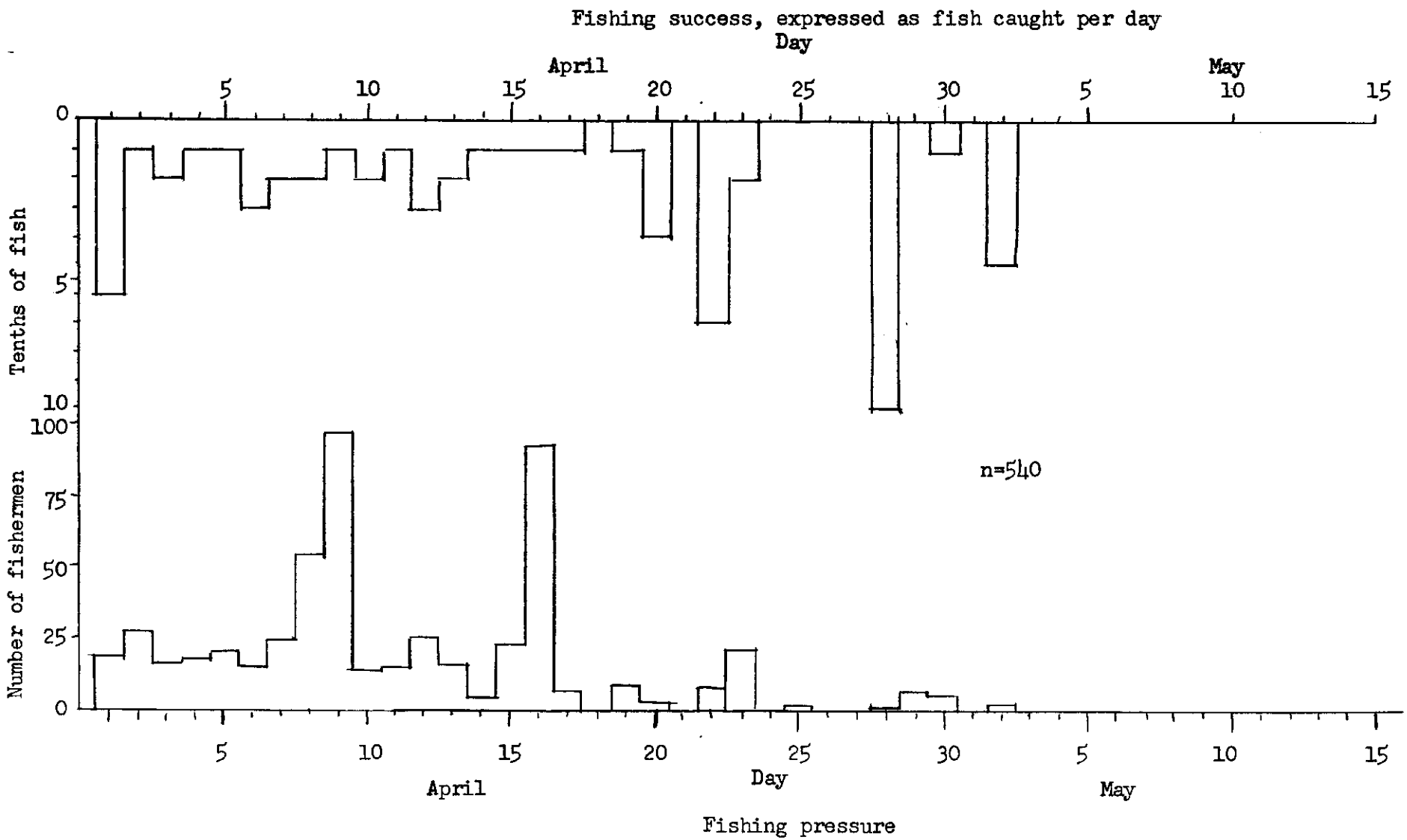


Figure 8. Number of steelhead, by day, checked through South Fork Salmon River drainage checking stations, upper South Fork, 1961.

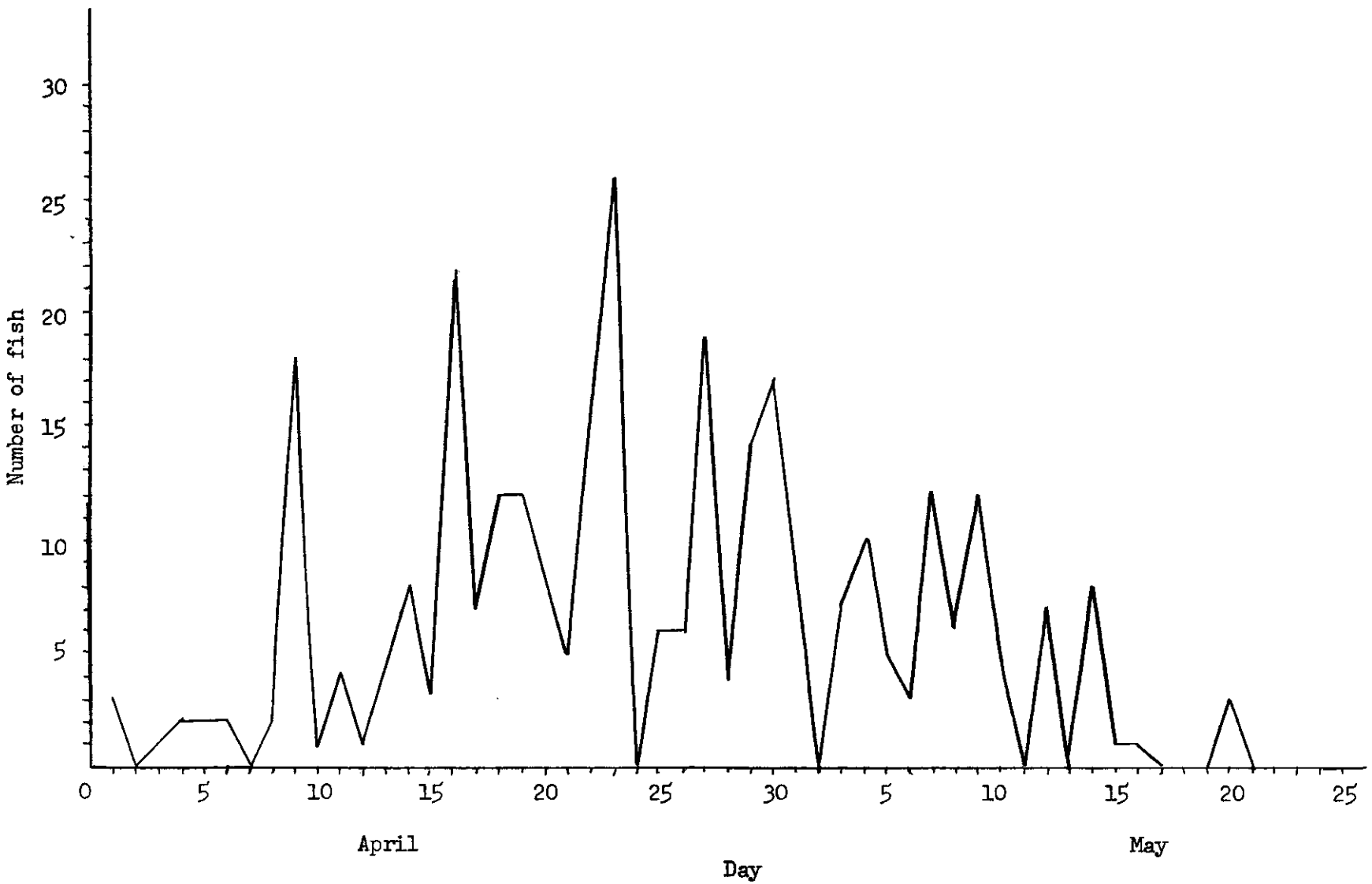


Figure 9. Number of steelhead, by day, checked through South Fork Salmon River drainage checking station, lower South Fork, 1961.

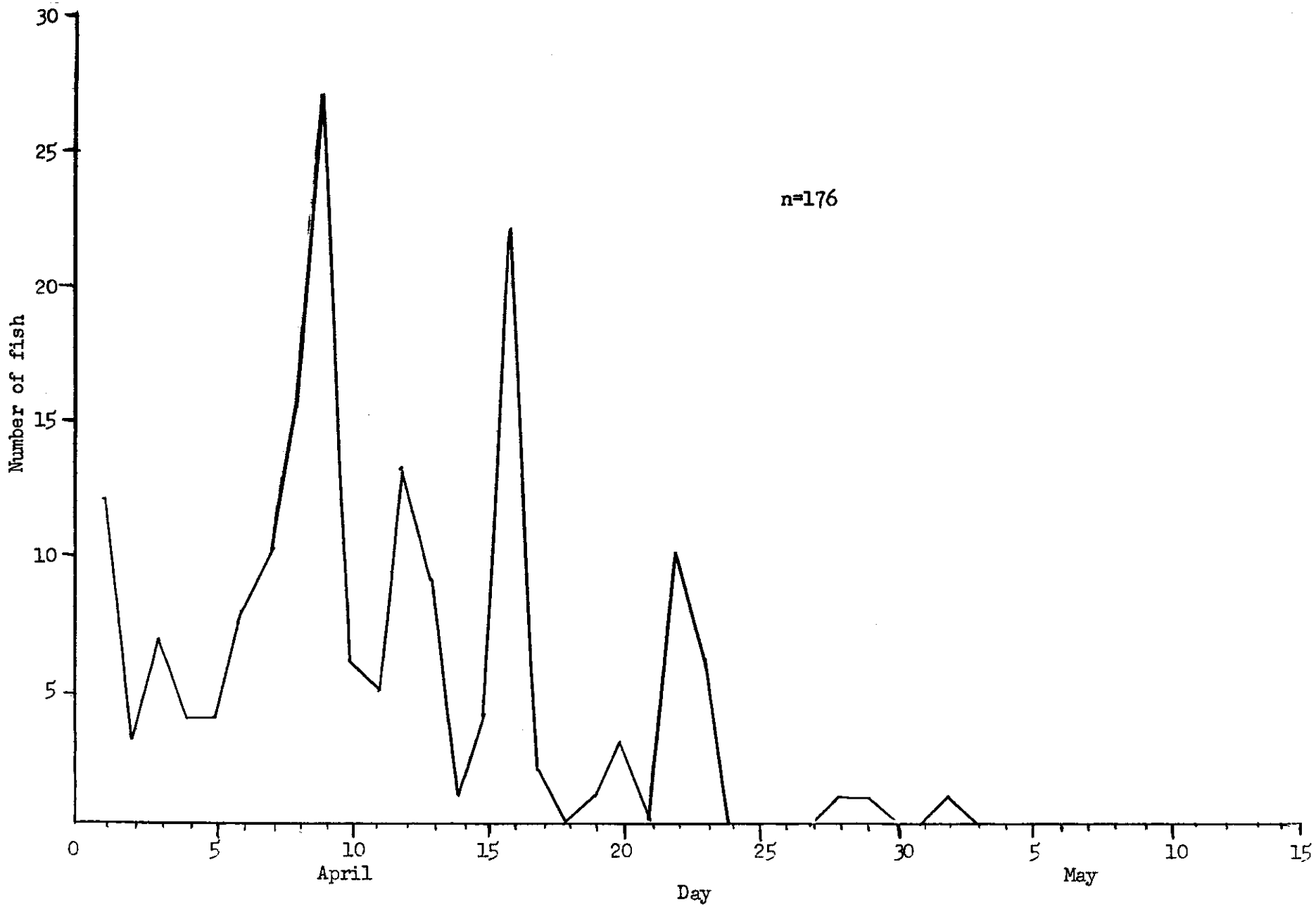


Figure 10. Number of steelhead fishermen checked, by fishing period and by week, Makay Bar steelhead fishery, 1960-61.

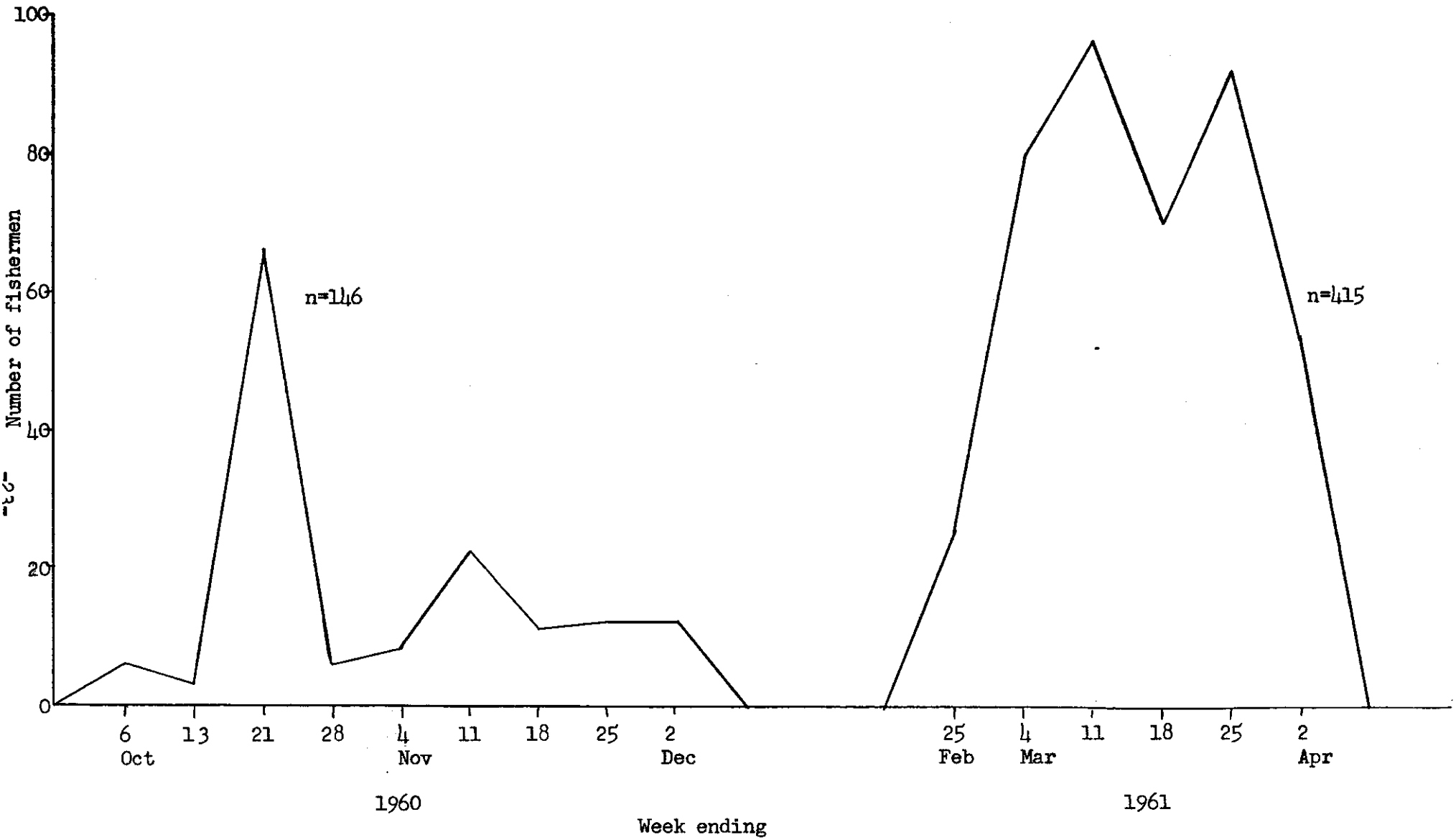
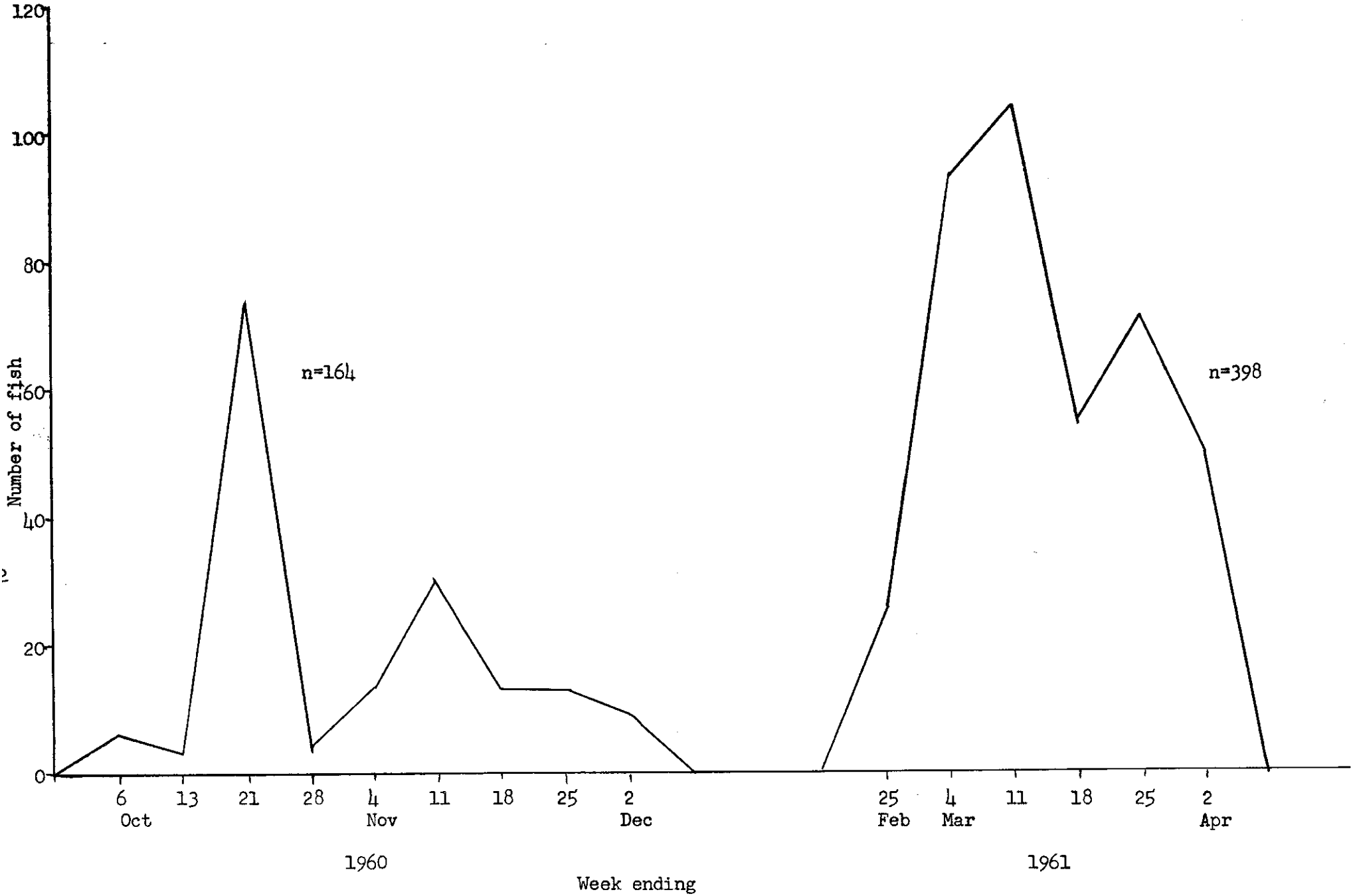


Figure 11. Number of steelhead harvested, by fishing period and by week, Makay Bar steelhead fishery, 1960-61.



APPENDIX

List of Tables

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Table 1. Steelhead checking station data, South Fork Salmon River drainage, 1961

Date	Number of fishermen	Fisherman days reported	Number of fish
4- 1	25	28	15
2	45	61	4
3	19	32	8
4	29	45	6
5	31	51	6
6	29	55	11
7	31	59	11
8	86	135	19
9	140	293	47
10	22	51	8
11	27	45	9
12	34	62	17
13	32	71	13
14	15	19	9
15	69	100	9
16	197	354	50
17	21	34	9
18	24	42	12
19	43	68	16
20	49	84	17
21	21	39	9
22	51	76	27
23	135	240	37
24	10	12	0
25	5	5	6
26	12	27	6
27	39	51	19
28	25	37	16
29	68	107	15
30	169	270	22
5- 1	20	26	10
2	13	19	4
3	29	45	7
4	15	21	10
5	13	17	5
6	18	18	3
7	45	97	12
8	5	5	6
9	18	30	14
10	15	23	6
11	5	7	0
12	17	26	7
13	11	11	1
14	47	75	15
15	2	2	1
16	8	26	3
17	4	6	0
18	3	9	0
19	6	6	1
20	9	17	3
21	13	13	0
Total	1,819	3,052	561

Table 2. Steelhead checking station data, South Fork Salmon River drainage, upper South Fork, 1961

Date	Number of fishermen	Fishermen days reported	Number of fish
4- 1	6	9	3
2	16	20	0
3	3	3	1
4	11	17	2
5	11	16	2
6	12	20	2
7	5	10	0
8	30	47	2
9	37	94	18
10	5	9	1
11	12	12	4
12	2	3	1
13	13	20	4
14	10	12	8
15	39	54	3
16	83	137	22
17	9	11	7
18	24	42	12
19	28	48	12
20	35	60	9
21	17	31	5
22	32	48	15
23	90	157	26
24	8	8	0
25	4	4	6
26	9	17	6
27	39	51	19
28	16	20	4
29	58	89	14
30	131	207	17
5- 1	17	23	9
2	2	2	0
3	29	45	7
4	13	15	10
5	13	17	5
6	18	18	3
7	43	95	12
8	5	5	6
9	14	14	12
10	14	20	5
11	5	7	0
12	17	26	7
13	5	5	0
14	36	55	8
15	2	2	1
16	5	21	1
17	4	6	0
18	0	0	0
19	4	4	0
20	9	17	3
21	13	13	0
Total	1,063	1,686	314

Table 3. Steelhead checking station data, South Fork Salmon River drainage, lower South Fork, 1961

Date	Number of fishermen	Fisherman days reported	Number of fish
4- 1	19	19	12
2	27	39	3
3	16	29	7
4	17	26	4
5	20	35	4
6	15	31	8
7	24	43	10
8	54	86	16
9	96	180	27
10	14	34	6
11	15	33	5
12	25	49	13
13	16	48	9
14	5	7	1
15	22	33	4
16	92	175	22
17	6	17	2
18	0	0	0
19	9	12	1
20	3	7	3
21	0	0	0
22	9	15	10
23	21	36	6
24	0	0	0
25	1	1	0
26	0	0	0
27	0	0	0
28	1	1	1
29	6	12	1
30	5	11	0
5- 1	0	0	0
2	2	2	1
Total	540	981	176

Table 4. Steelhead checking station data, South Fork Salmon River drainage, Johnson Creek, 1961

Date	Number of fishermen	Fishermen days reported	Number of fish
4-12	1	1	1
13	0	0	0
14	0	0	0
15	0	0	0
16	6	10	2
17	6	6	0
18	0	0	0
19	4	4	3
20	11	17	5
21	4	8	4
22	3	3	2
23	9	18	4
24	2	4	0
25	0	0	0
26	2	6	0
27	0	0	0
28	7	14	10
29	0	0	0
30	27	40	5
5- 1	2	2	0
2	4	10	2
3	0	0	0
4	2	6	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	4	16	2
10	1	3	1
11	0	0	0
12	0	0	0
13	6	6	1
14	7	12	5
15	0	0	0
16	3	5	2
17	0	0	0
18	3	9	0
19	2	2	1
20	0	0	0
21	0	0	0
Total	116	202	50

Table 5. Steelhead checking station data, South Fork Salmon River drainage, East Fork, 1961

Date	Number of fishermen	Fisherman days reported	Number of fish
4- 1	0	0	0
2	2	2	1
3	0	0	0
4	1	2	0
5	0	0	0
6	2	4	1
7	2	6	1
8	2	2	1
9	7	19	2
10	3	8	1
11	0	0	0
12	6	9	2
13	3	3	0
14	0	0	0
15	8	13	2
16	16	32	4
17	0	0	0
18	0	0	0
19	2	4	0
20	0	0	0
21	0	0	0
22	7	10	0
23	15	29	1
24	0	0	0
25	0	0	0
26	1	4	0
27	0	0	0
28	1	2	1
29	4	6	0
30	6	12	0
5- 1	1	1	1
2	5	5	1
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	2	2	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	4	8	2
Total	100	183	21

Table 6. Steelhead harvest data, Makay Bar steelhead fishery, spring fishing period, 1960

Date	Number of fishermen	Fishermen days reported	Number of fish
3-14	4	8	8
16	2	2	1
17	2	2	3
19	21	32	8
20	15	15	1
31	1	2	2
4- 2	4	4	0
3	4	4	2
4	2	2	2
5	3	3	6
7	1	1	1
16	1	1	0
22	5	10	2
28	2	2	0
29	3	3	0
Total	70	91	36

Table 7. Steelhead harvest data, Makay Bar steelhead fishery, fall fishing period, 1960

Date	Number of fishermen	Fisherman days reported	Number of fish
9-29	2	2	3
10- 1	4	4	3
9	3	3	3
13	1	1	1
15	22	22	33
16	4	8	5
17	3	3	3
18	15	15	14
19	18	18	14
20	3	3	3
23	3	3	2
25	3	3	2
11- 1	2	2	1
2	3	3	6
3	3	3	6
6	8	8	8
7	6	6	10
10	8	12	12
13	3	3	5
14	8	8	8
21	6	6	7
23	6	6	6
25	3	3	3
26	8	8	5
28	1	1	1
Total	146	154	164

Table 8. Steelhead harvest data, Makay Bar steelhead fishery, spring fishing period, 1961

Date	Number of fishermen	Fisherman days reported	Number of fish
2-18	4	4	2
19	2	2	0
20	2	2	2
21	2	2	2
22	5	5	6
23	9	9	12
24	1	1	1
25	7	7	9
26	22	22	19
27	8	8	9
28	24	24	31
3- 2	10	10	12
3	8	8	13
4	10	10	10
5	9	9	14
6	7	7	4
7	15	15	15
8	30	30	37
9	17	17	12
10	8	8	12
11	7	7	4
12	21	21	13
13	6	6	9
14	6	6	3
15	7	7	7
16	8	8	5
17	15	15	14
18	19	19	17
19	35	35	17
20	3	3	2
21	5	5	3
22	10	10	9
23	8	8	7
24	12	12	16
25	10	10	8
26	15	23	6
27	4	4	5
29	8	8	13
30	4	4	8
4- 1	12	12	10
Total	415	423	398

STATE OF IDAHO DEPARTMENT OF FISH AND GAME

SNAKE RIVER FALL CHINOOK SPAWNING GROUND SURVEY 1961

Monte Richards Fishery Biologist II

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INTRODUCTION

The 1961 Snake River fall chinook spawning ground 5.: ,7e: was conducted 'ay the Idaho Fish and Game Department. Also participating were U. S. Fish and Wildlife Service personnel. Methods and procedures used were the same as in past years.

FISH PASSAGE COUNTS

The count of fall chinook salmon transported past Oxbow-Brownlee Dams in 1961 totaled 46161. The count, by month, is shown in Table I.

Table 1. Fall chinook salmon count, by month, Oxbow Dam, 1961

Month	Number of fish
August	0
September	3,162
October	1,441
November	12
December	1
Total	4,616*

* An additional 2,025 fish arrived at the dam but were removed for egg-taking purposes.

GROUND SURVEYS

The stream section from Swan Fails Dam to Given's Hot Springs was surveyed on November 13 and 14 (Figure 1). This survey was comparable to past, annual surveys.

In conjunction with a tagged fish study to evaluate fish transportation past Oxbow-Brownlee Dams, sponsored by Idaho Power Company, Idaho Fish and Game Department personnel, assisted by U. S. Fish and Wildlife Service personnel, took periodic dead fish samples throughout the spawning period.

A total of 129 dead fish were observed on the annual survey, and approximately 450 dead fish were checked on the tagging study surveys,. Ground survey data for the annual survey are summarized in Table

1/

Figure 1. Outline of Snake River fall chinook ground survey area (Swan Falls Dam to Marsing).

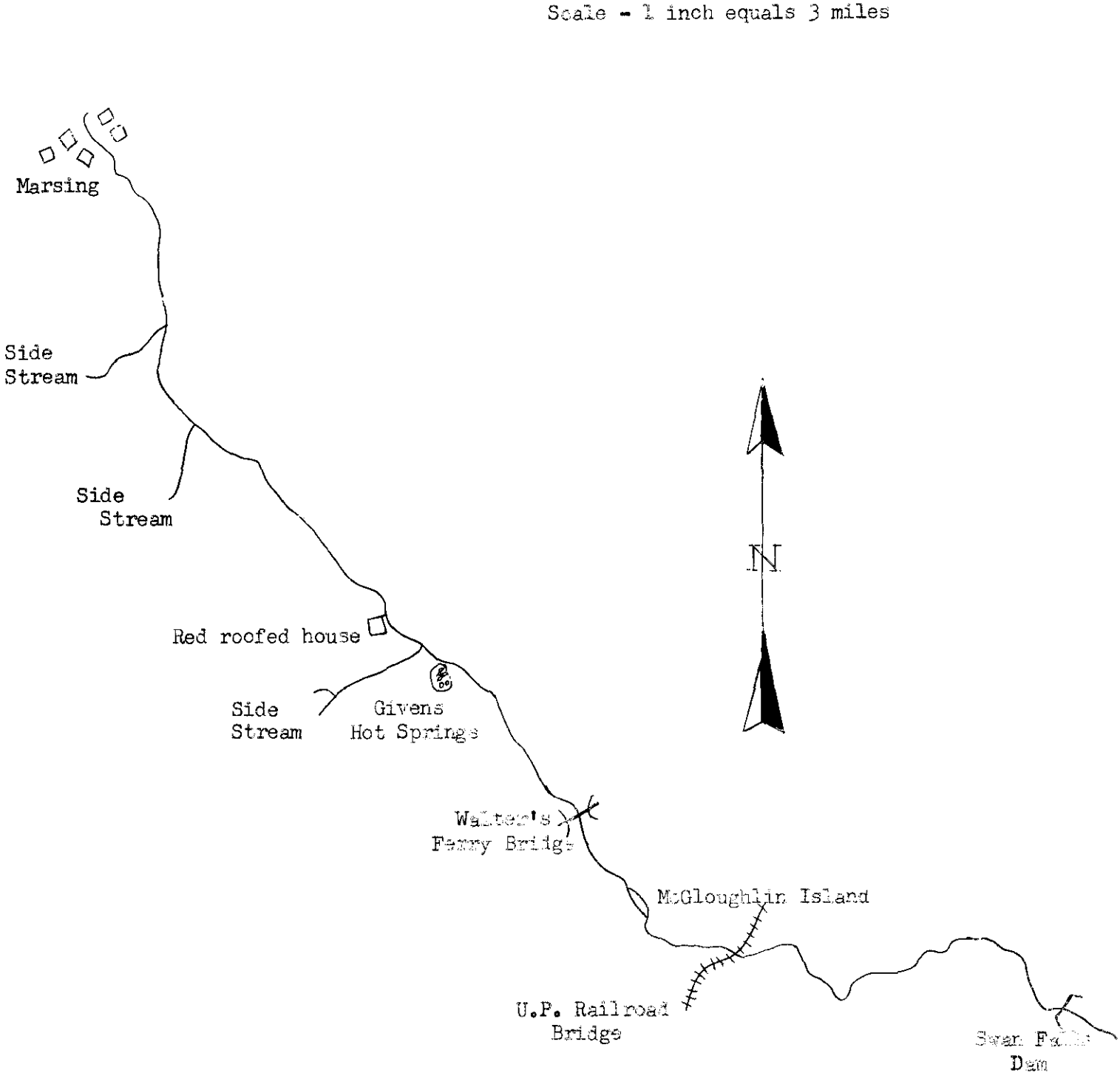


Table 2. Summary of Snake River fall chinook spawning ground survey dead and live fish counts, annual survey, 1961.

Stream area	Date	Dead Fish					Live fish	Visibility
		Male	Jack	Female	Unident.	Total		
Swan Falls Dam to Railroad bridge	11-13	18	0	14	0	32	16	Good
Railroad bridge to McGloughlin Island	11-13	10	3	2	0	15	8	Good
McGloughlin Island to Walter's Ferry	11-13	9	2	18	0	29	3	Good
Walter's Ferry to Given's Hot Springs	11-14	27	11	15	0	53	9	Good
Totals		64	16	49	0	129	36	

SEX RATIOS AND LENGTH FREQUENCIES

Sex ratios and length frequencies presented for past Snake River fall chinook spawning ground surveys have been based on the assumption that dead male and female f are equally available throughout the length of the spawning period. During past surveys however, a differential rate of recovery for dead malle and female fish has been noted the spawning period progressed. Observations indicated that dead female fish regular: became more available than males during the latter part of the spawning period. The probability that sex ratios, obtained from one survey during the spawning period, are based on inadequate sampling has been recognized, (Richards, 195', 1958)1/ In conjuction with a fall chinook tagging study during A961, a sense of serves were made for the first time throughout the entire spawning period.. This presented an opportunity evaluate sampling methods used on the annual fall. chinook spawning ground surveys.

The sex ratio obtained from the annual survey, made early in the spawning period, was 1. 6 males to 1 female. The sex re[s]in obtained from the tagging sward) surveys. mad throughout the spawning period. was 0.5 male to 1 female." Sex ratio data for- the tagging study surveys, by survey, are shown in Table 3 Data from comparable surveys only are used. The appearance of a p[r]opo[r]tionally grea[te]r number of females as the

Richards, M. R., Snake River fall chinook spawning ground survey. Idaho Department of Fish and Game, 1957-1958.

2/ Tagging survey data provided by study program for Brewniee-Oxbow Fish Facilities Evaluation.

spawning period progresses is demonstrated.

It is evident that one survey made early in the spawning period would provide misleading sex ratio data. Assuming that the dead fish which appear as the season progresses remained equally available for a relatively long period of time, a survey made later in the spawning period would increase the sample size and reduce this error. Based on the 1961 data, however, a considerable error would still be present if the survey was made within approximately a month after dead fish start appearing, regardless of sample size (Table 3). An assumption that progressively appearing dead fish would remain equally available for periods as long as three weeks or a month would not be valid. One survey made late in the spawning period would also provide misleading data.

Because of the differential recovery rate for male and female fish as the spawning period progresses, the only reliable method of obtaining accurate sex ratios would be by a series of comparable surveys made throughout the length of the spawning period.

Length frequency distributions obtained from one survey during the spawning period would also be non-representative. Indicated age-classes two and three normally contain predominantly male fish; age-class four contains predominantly female fish (Figure 3). Because of the different sex ratios within age-classes, sampling which provides non-representative sex ratios will also provide non-reporesentative length frequency distributions and misleading information as to comparative size of age-classes. The difference in length frequencies obtained from the annual survey and from the tagging study surveys is demonstrated in Figure 2.

The length frequency distribution obtained from the annual survey indicates age-class three to be approximately the same size as age-class four. The length frequency distribution obtained from the tagging study surveys indicates age-class four to be much larger than age-class three. The sample size for the annual survey is considerably smaller than the sample used for the tagging study surveys. Data in Table 3, however, indicate that increased sample size for the annual survey would not greatly change the sex ratio and comparative size of indicated age-classes if the additional sampling was confined to approximately the same stage of the spawning period.

During past years there has been close agreement between the spawning ground jack percentage and the jack percentage obtained from counts at Oxbow Dam.1/ This agreement has tended to substantiate both the spawning ground data and the jack counts at Oxbow Dam.

The 1961 spawning ground jack percentage, obtained from the annual survey only, was 12.4. This again is in reasonable agreement with the Oxbow Dam percentage of 16.4 percent. The jack percentage obtained from the tagging study surveys, however, was 7.8. It would appear, on the basis of the 1961 data, that the jack counts at Oxbow Dam have been high and that spawning ground data based on inadequate sampling have substantiated them.

Sex ratios and length frequency distributions obtained from past surveys have been based primarily on one survey during the spawning period. Occasionally, additional. samples have been taken but these samples have been greatly outweighed by the one annual survey sample. Sex ratios and length frequency distributions presented for past surveys have very probably been non-representative of the spawning population. Based on findings from the 1961 data they could have been considerabley misleading.

The annual surveys have all been made at roughly the same stage of the spawning period. Based on the 1961 data, sex ratios presented for past surveys would be high in males. Length frequency distributions would show the indicated size of age-classes two and three, as compared to age-class four, to be larger than actually represented in the spawning population.

Sex ratio and length frequency data presented for 1961. were obtained from comparable surveys made periodically throughout the spawning period and are considered to be reasonably representative of the spawning population.

The sex ratio of 503 fish was 0.5 male to 1 female. Length frequency distributions are shown in Table 4 and Figures 3 and 4. Fork length to the nearest lower whole inch was the measurement used. The length frequency distribution indicates that the bulk of the run was made up of four-year old fish. Jacks comprised 7.8 percent of the sample.

1/ Jacks are arbitrarily defined as male fish with a fcrk length of 24 inches or less.

Table 3. Tagging study survey sex ratio data, by comparable survey, Snake River fall chinook spawning grounds, 1961.

Survey period	Number of fish sampled	Cumulative total	Number of males	Cumulative total	Number of females	Cumulative total	Sex ratio[1]	Cumulative sex ratio
11/1 -11/6	18	18	8	8	10	10	0.8 : 1	0.8 : 1
11/8 -11/9	63	81	38	46	25	35	1.5 : 1	1.3 : 1
11/13-11/14[2]	105	186	64	110	41	76	1.6 : 1	1.4 : 1
11/17-11/21	67	253	27	137	40	116	0.7 : 1	1.2 : 1
11/27-11/30	107	360	17	154	90	206	0.2 : 1	0.7 : 1
12/4 -12/7	67	427	11	165	56	262	0.2 : 1	0.6 : 1
12/18-12/22	24	451	7	172	17	279	0.4 : 1	0.6 : 1
12/26-12/29	38	489	2	174	36	315	0.1 : 1	0.5 : 1
1/3 - 1/5	14	503	2	176	12	327	0.2 : 1	0.5 : 1

[1] Male to female.
[2] Comparable data from annual survey.

Table 4. Fork length frequency distribution, by sex, of fall chinook found dead on Snake River spawning grounds, 1961 (measured to nearest lower whole inch).

Length in inches	Male	Female	Combined
14	1		1
15	1		1
16	2		2
17	1		1
18	1		1
19	6		6
20	4	2	6
21	3	1	4
22	5	2	7
23	6		6
24	10	2	12
25	14	4	18
26	10	6	17
27	12	7	19
28	11	5	17
29	4	11	15
30	1	20	21
31	3	20	23
32	7	24	31
33	8	35	44
34	3	57	60
35	7	59	66
36	11	36	48
37	2	22	24
38	12	11	23
39	10	1	11
40	6	1	7
41	8		8
42	2	1	3
43	2		2
44	3		3
Total	176	327	507*

* Includes four fish not identified as to sex.

Figure 2. Comparison of fork length frequency distribution of fall chinook found dead on Snake River spawning grounds, annual survey and tagging study surveys, 1961.

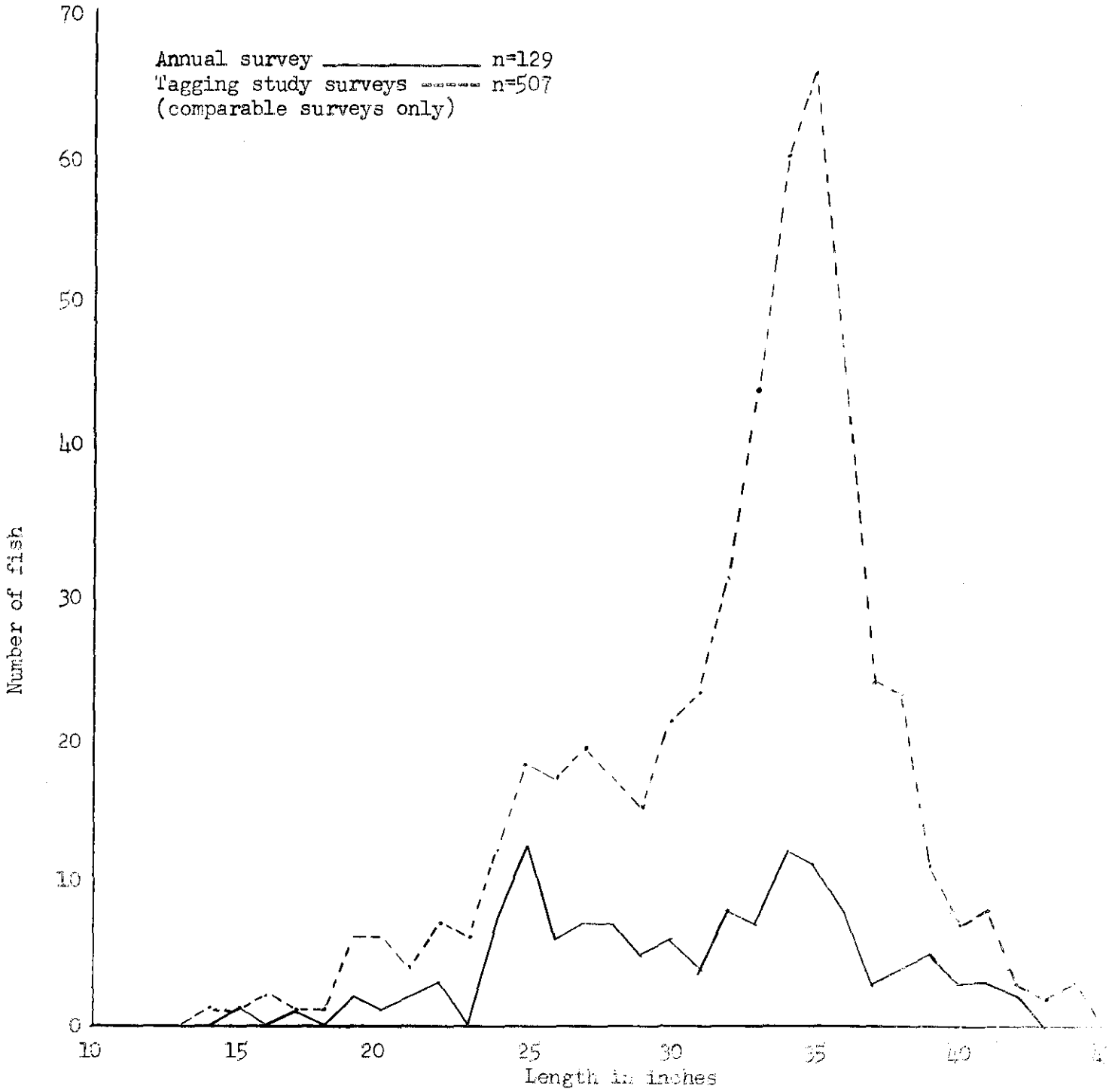


Figure 3. Fork length frequency distribution, by sex, of fall chinook found dead on Snake River spawning grounds, 1961.

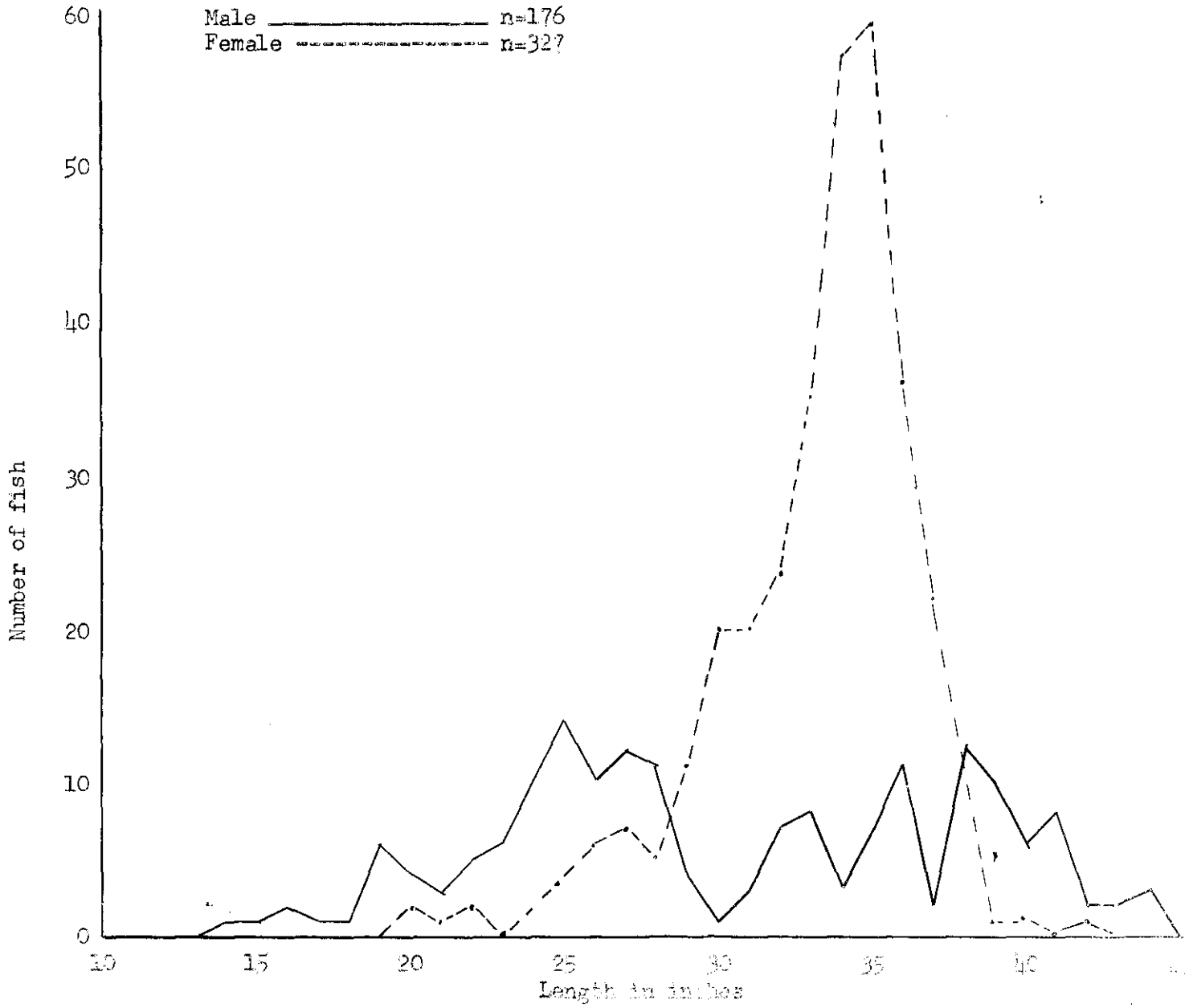
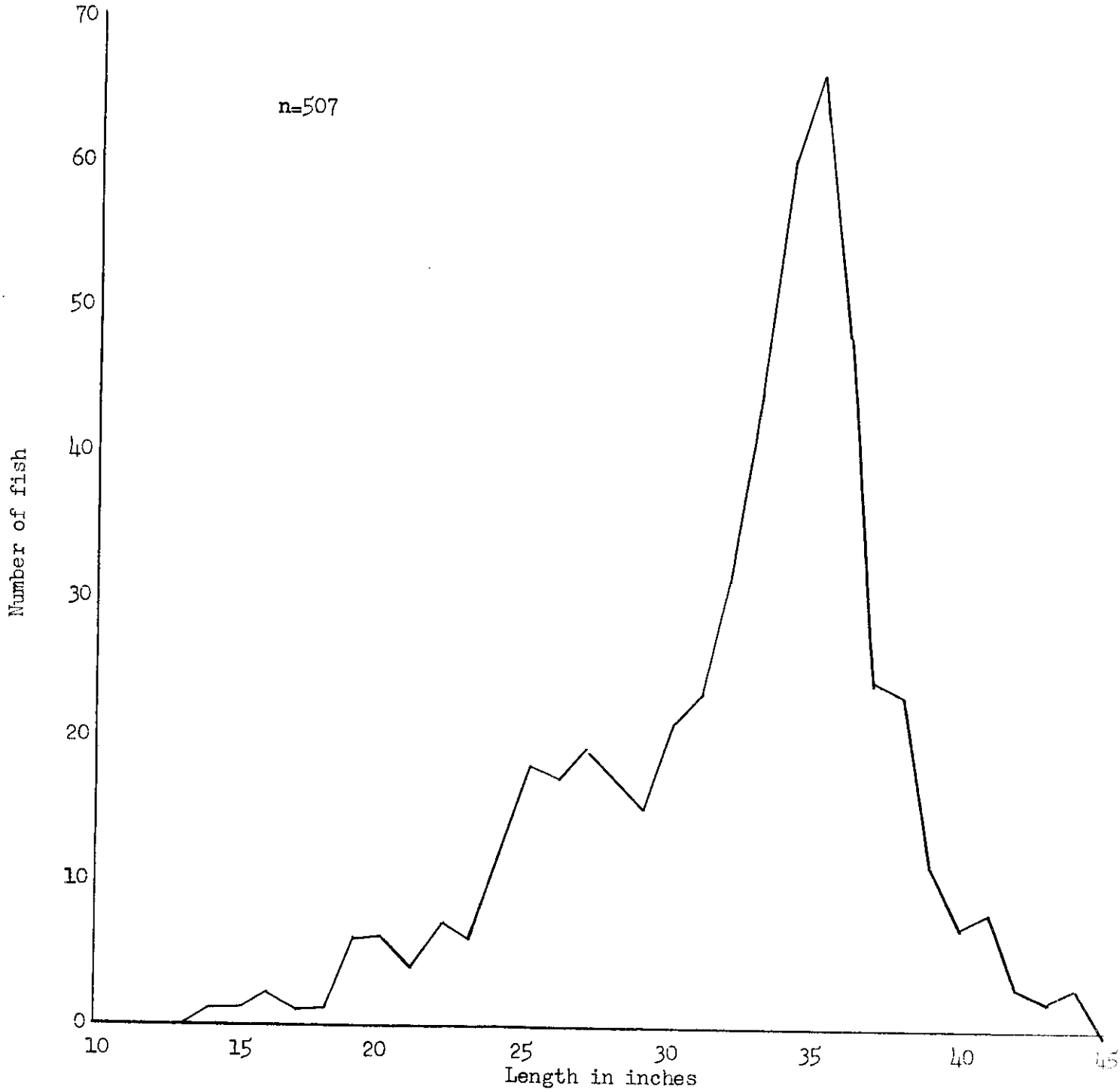


Figure 4. Fork length frequency distribution of fall chinook found dead on Snake River spawning grounds, 1961.



SPAWNING SUCCESS

Relative spawning success was determined by gonad examination of dead fish. The same classification as in past Snake River fall chinook surveys was used. Relative spawning success is shown in Table 5.

Table 5. Relative spawning success of Snake River fall chinook, by percent, 1961.

	Number of fish	Degree spawned by percent		
		Spent	Partially	Unspawned
Male	195	92	6	2
Female	374	94	2	4

AERIAL SURVEY

Aerial redd counts from Swan Falls Dam to the Interstate Bridge below Oxbow Dam were made on November 11 (Figure 5). Visibility was considered good above the mouth of the Boise River and poor below this point. The Salmon River from Riggins to the mouth was surveyed on November 19. Visibility was considered excellent.

Snake River aerial redd counts are shown, by river section, in Tables 6 and 7. No redds were observed in the Salmon River.

Table 6. Snake River fall chinook aerial redd counts, by river section, Swan Falls Dam to mouth of Boise River, 1961.

River section	Number of redds
Swan Falls Dam to Railroad bridge	430
Railroad bridge to Walter's Ferry	543
Walter's Ferry to Given's Hot Springs	52
Given's Hot Springs to Marsing	10
Marsing to Homedale	9
Homedale to mouth of Boise River	2
Total	1,037

Figure 5. Outline of Snake River fall chinook aerial survey area (Swan Falls Dam to Interstate bridge below Oxbow Dam)

Scale 1 inch equals 22.5 miles

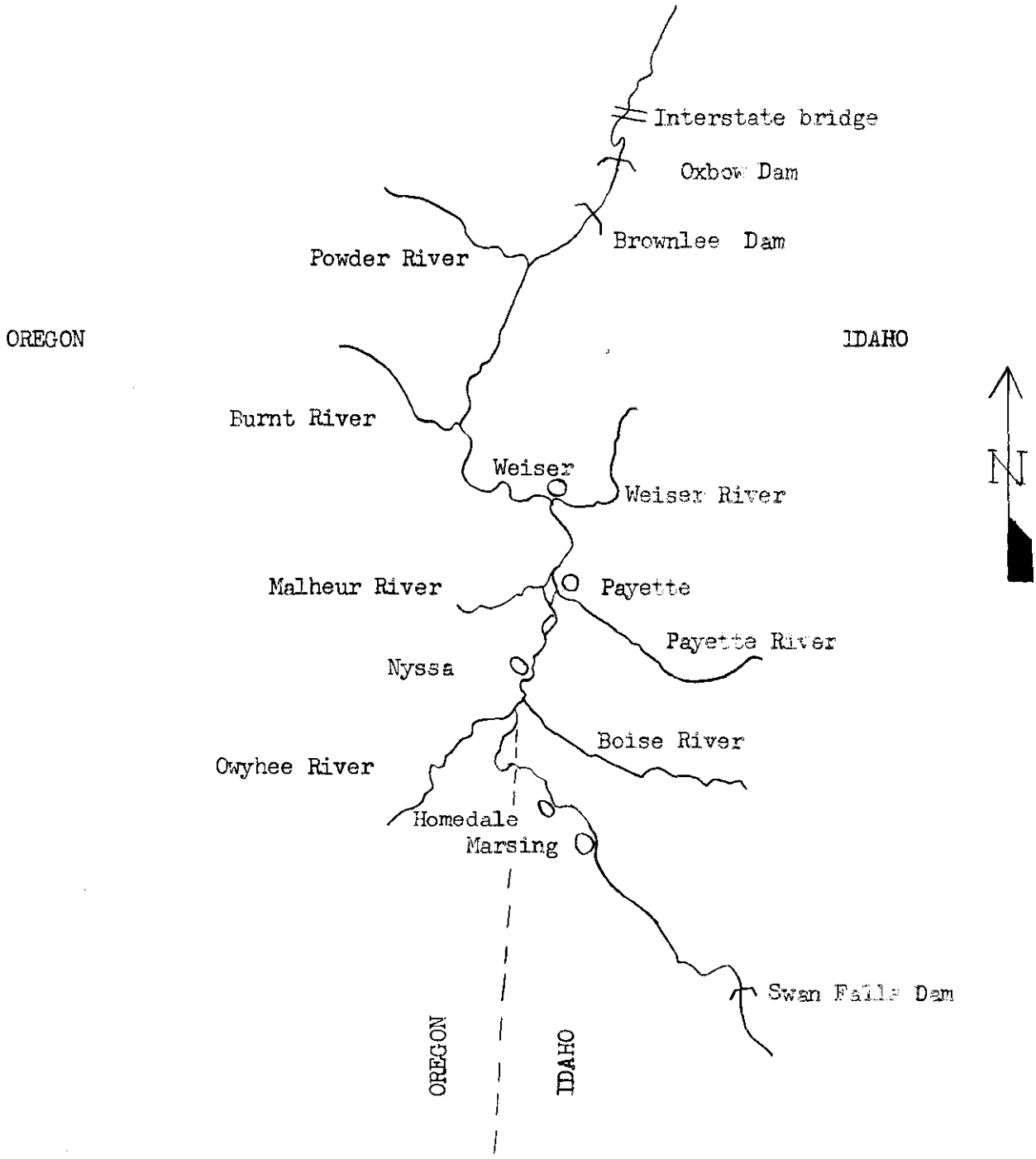


Table 7. Snake River fall chinook aerial redd counts, by river section, mouth of Boise River to Interstate bridge, 1961.

River section	Number of redds
Mouth of Boise River to Payette	0
Payette to Weiser	6
Weiser to Brownlee Pool	0
Oxbow Dam to Interstate bridge	59
Total	65

DISEASE

Fish bearing lesions typical of columnaris, in sample, were recorded. The sample was limited to carcasses fresh enough that accurate determinations could be made and to carcasses examined by an observer familar with columnaris lesions.— Because of the absence of a pathologist on the survey, only fish with obvious gill lesions were re-corded. If obvious gill lesions were not present, no attempt was made to determine body lesions and the fish was recorded as being free of typical. columnaris lesions.

A sample of 52 dead fish showed typical gill lesions to be present in 61.5 percent of the fish sampled. Number and percent of sampled fish with gill lesions typical. of columnaris, by sex and by size classification for males. are shown in Table C.

Table 8. Number and percent of sample, of fall chinook with gill lesions typical of columnaris, by sex and by size classification for males, Snake River spawning grounds, 1961.

	Number in sample	Number of fish with lesions	Percent of sample
Large males	21	14	66.6
Jacks	10	4	40.0
Females	21	14	66.6
Total	52	32	61.5

1/ Determination of gill lesions typical of columnaris made by author.

STATE OF IDAHO
DEPARTMENT OF FISH AND
GAME 518 Front Street

Errata sheet for:

Snake River Fall Chinook Spawning Ground Survey, 1960. Monte Richards.

1. Page 5. The sex ratio of 252 fish sampled on the spawning grounds should be 2.4 males to 1 female instead of 4.7 males to 1 female.

2. Page 17. (summary) Same as above.